Making Progress

Implementing HEI's Strategic Plan 2020 – 2025

Meeting between the HEI Research

Committee and Sponsors

February 17, 2021 10:00 AM – 12:30 PM

Connect at

https://zoom.us/j/91433051913?pwd=eWlqSlU1UWNkd0l0MmJWTnpnRUo0Zz09

Meeting ID: 914 3305 1913 Passcode: 910759

Trusted Science • Cleaner Air • Better Health

Our Agenda Today

10:00 **Opening Comments (David Savitz)**
Introduction (Dan Greenbaum)

10:10 **HEI Progress and Future Perspectives (Dan Greenbaum, Annemoon van Erp, Bob O'Keefe)**

Implementing the Strategic Plan 2020–2025: Recent and New Research Initiatives

- **Accountability**
- **The Air Pollution Mixture**
- **Transport and Urban Health**
- **Global Health**
- **Promoting Inclusion**

10:50 **Questions and Discussion**

11:10 Sponsor Presentations
- US EPA
- JAMA/Toyota
- Ford
- ExxonMobil
- API
- Other?

12:00 Facilitated Discussion

12:20 Follow-up and Next steps

12:30 Adjourn

An Introduction:
Welcoming our New Director of Science

- *We are pleased to announce that, after a comprehensive nationwide search, Dr. Ellen Mantus has agreed to join HEI as out new Director of Science, beginning May 3, 2021!*
- *A number of you may already know Ellen, but just in case:*
  - *She has served for over 20 years at the National Academies of Science, Engineering and Medicine*
    - *Most recently as Scholar and Director of the Chemical Sciences Roundtable on the Board on Chemical Science and Technology ; previously on the Board of Environmental Studies and Toxicology*
  - *In that role, she has directed over 20 studies that were central to science and understanding and that advanced technology and the public health of the nation*
    - *Including, among many others, on toxicity testing, the health benefits of air quality regulations, electric vehicles, and health impact assessment*
  - *She also brings experience in the private sector as a project manager for ICF Consulting.*
  - *And received her PhD in Chemistry from Cornell University*
- *At the same time, we cannot emphasize enough that as we have conducted this search, HEI has benefitted tremendously from the leadership that Annemoon VanErp has provided and continues to provide for our science activities. Thank you Annemoon!*

HEI

HEI's Strategic Plan

Targeting HEI's research and review activities;

Responding to the needs of HEI industry & government sponsors, and other interested parties;

Anticipating future policy and technology events; and,

Evolving over time to adapt to changing knowledge and events

Thank you for your ongoing feedback as we developed and now implement the Plan

Choosing the Future

POTENTIAL TOPICS

Major Opportunities

- Testing the Links Between Air Quality Actions and Health
  - New and continued innovation in Accountability Studies
    - To inform decisions on benefits, causality
  - Targeting national and source-specific improvements in AQ
- Enhancing Understanding of the Air Pollution Complex Mixture; informing Ongoing air quality standards and guidelines decisions
  - Effects of long-term exposure to low levels of air pollution
  - Enhanced exposure to NO_2, UFP, and other key pollutants
  - Further analyses of PM Sources?
  - Mechanistic research
- Transportation and Urban Health
  - Reviewing the latest literature
  - Studying transport emissions in the context of SES, noise, green space
  - Sensitive populations
  - Exposure components of special interest
- Global Health
  - Understanding the Sources and their burdens
  - Tracking the State of Global Air
- Cross-cutting issues

Strategic Planning Process

Input from:

- Sponsors
  - EPA
  - Motor vehicle industry
  - Oil and other industry
- HEI scientific committees and board
- The Scientific Community
- The Environmental Community
- State and International Agencies
- Others

Selection Criteria:

- importance to public health, regulation, technology (short and long term)
- science
- research by others

The HEI Strategic Plan

2020 – 2025

…and beyond

Informing Challenging Air Quality and Health Decisions

- *Accountability: Testing the Links Between Air Quality Action and Health*
- *Complex Questions for the Air Pollution Mixture*
- *Transport and Urban Health*
- *Global Health*

Crosscutting Issues

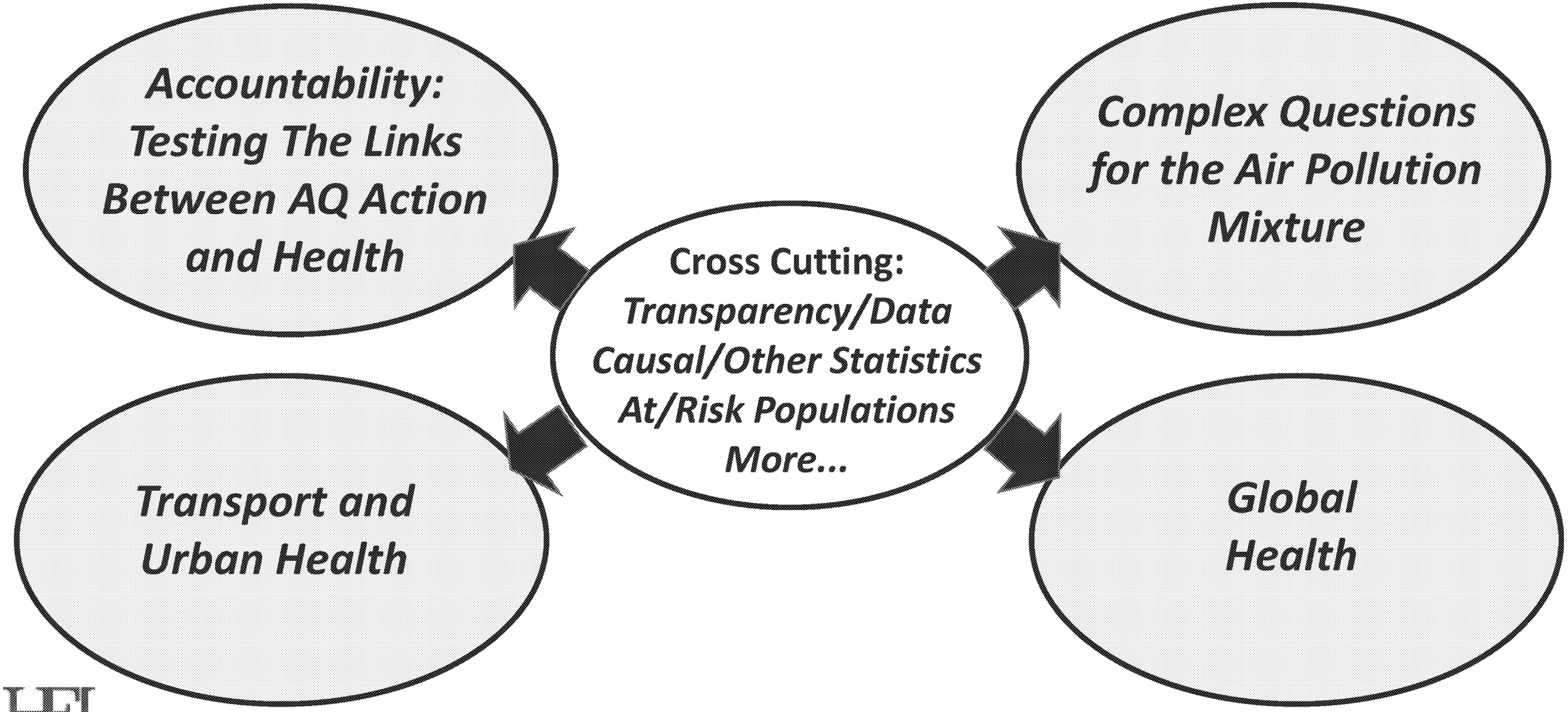
- Data Access and Transparency
- Statistical/Causal Models
- At-risk Populations
- Enhanced Exposure

Lower Priority Items ***(which will not be a focus)***

- Single pollutant research programs
- Climate Change and Health

HEI 5

The Four Key Opportunities….



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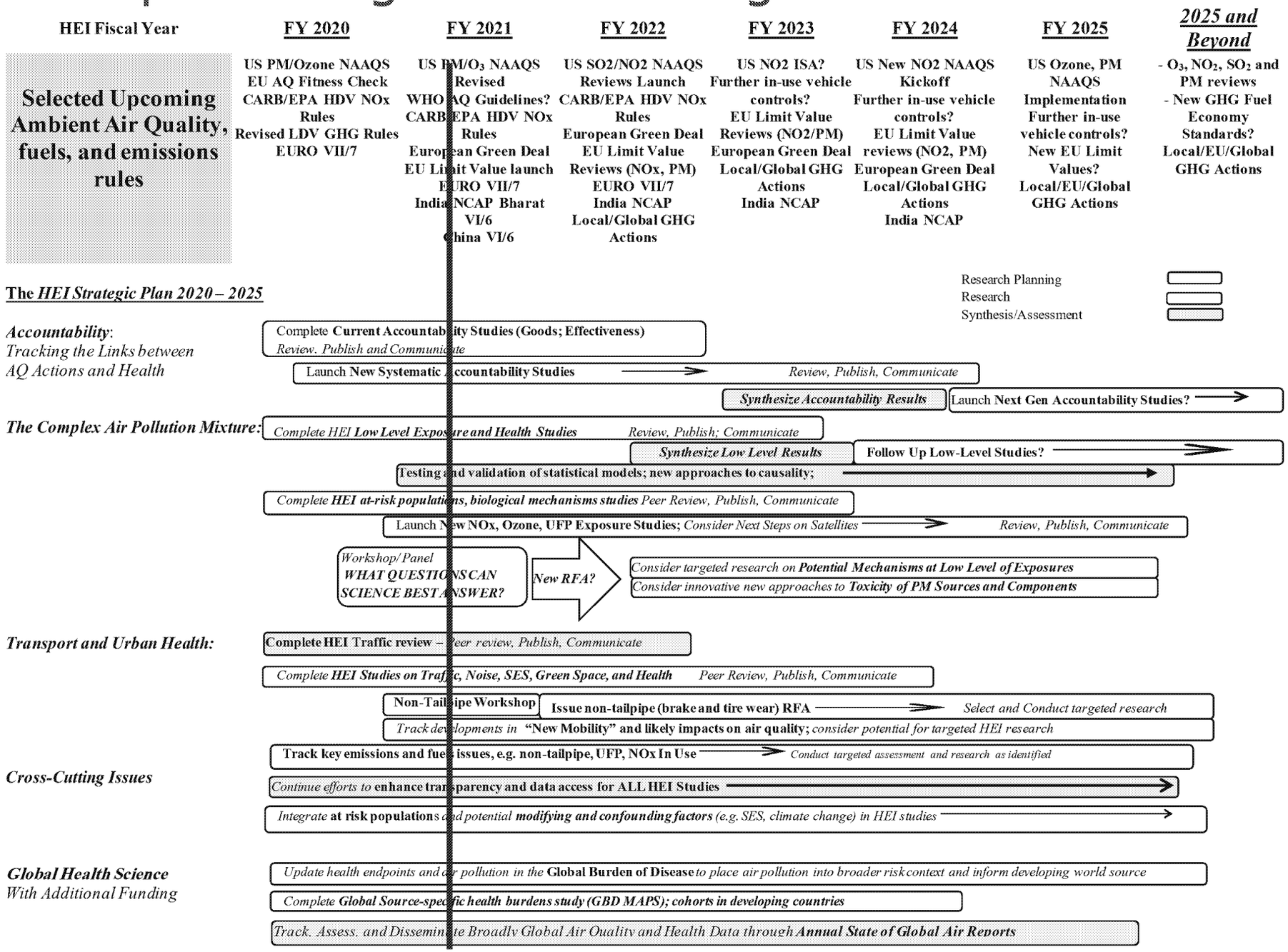
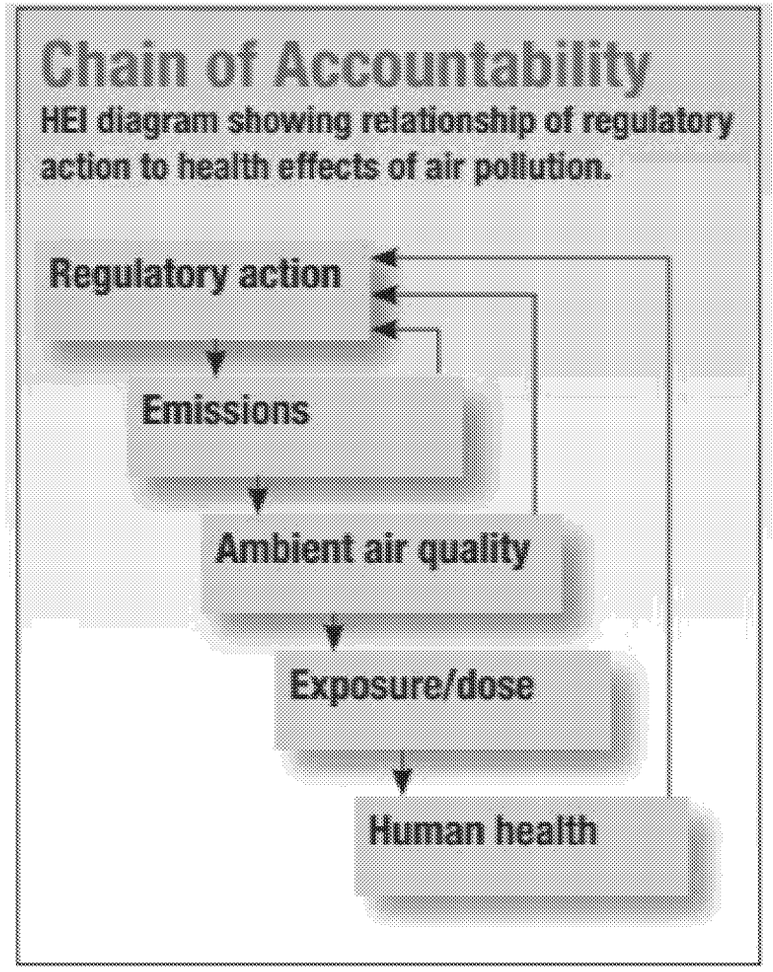


Accountability:
Testing The Links Between AQ Action and Health

- Can we better test (and quantify) what the air and health consequences are of AQ actions?
- How can examinations of AQ interventions help us analyze causal inference?
- Can these studies make for better cost and benefit analysis of future actions?
- 15+ studies to date:
  - Meng Goods Movement Study in press



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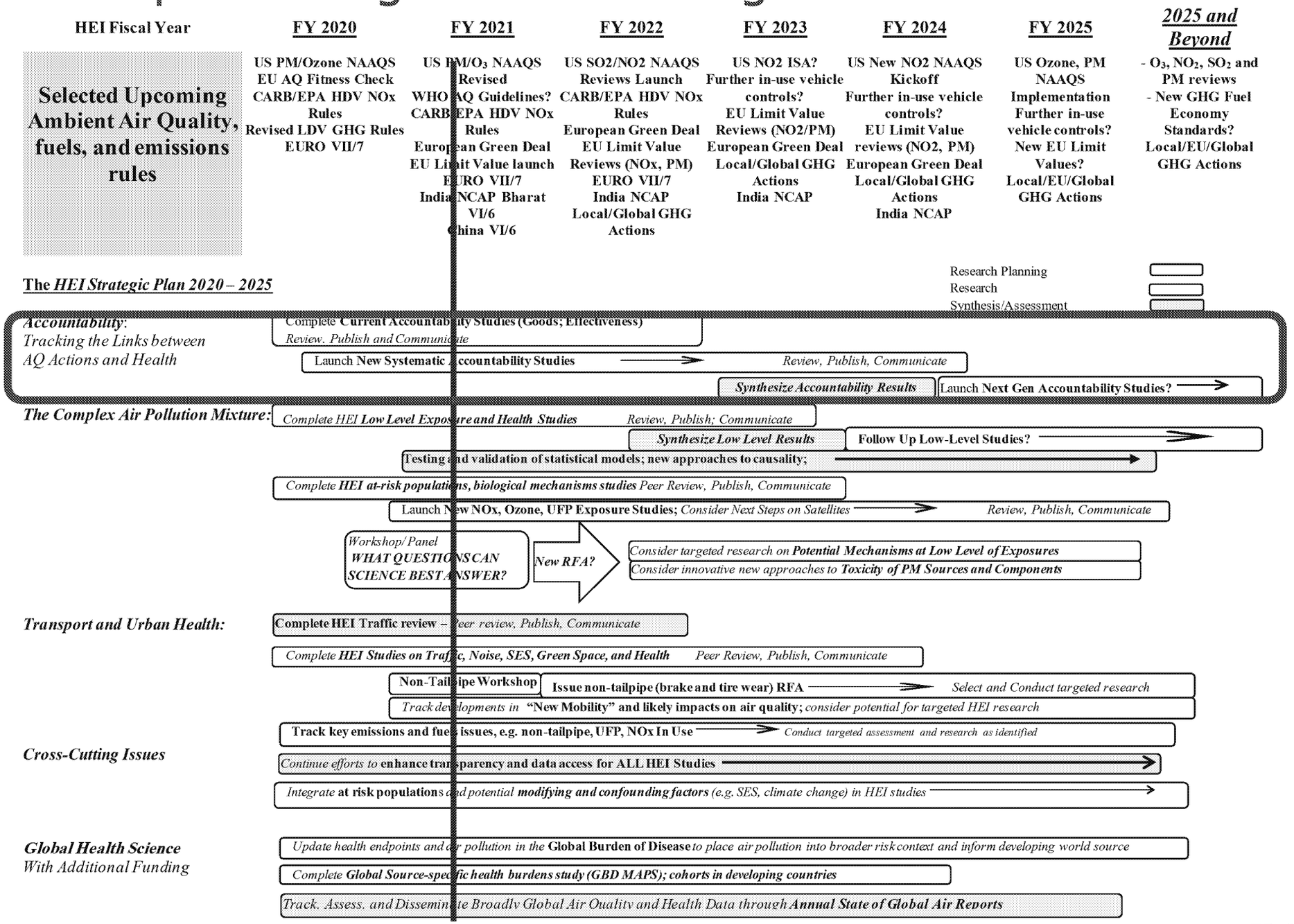
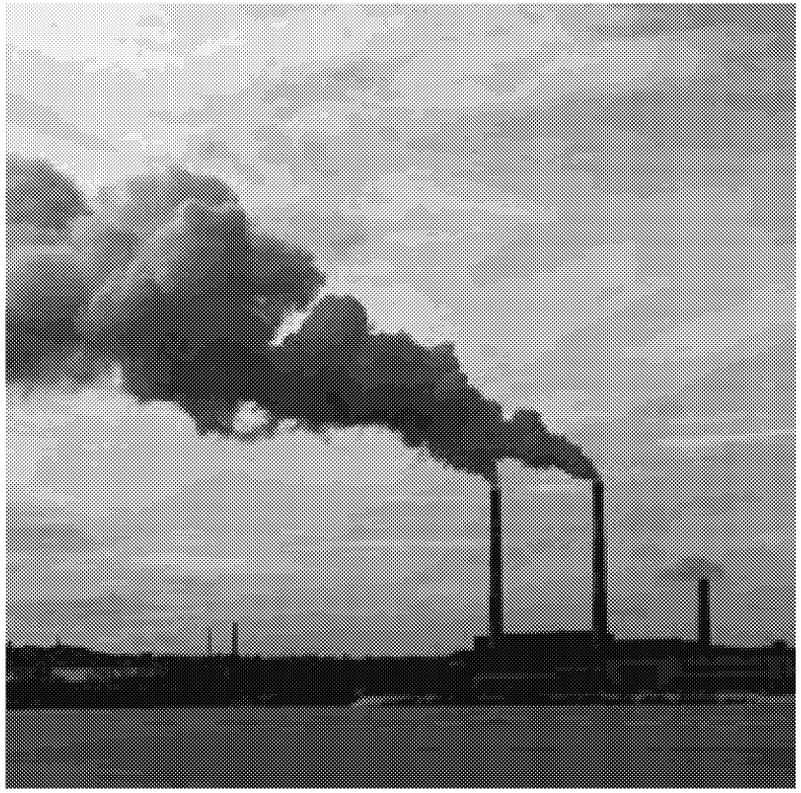


Next-Gen Accountability Research (RFA 18-1)

- Assessing improved air quality and health from national, regional, and local air quality actions
- Four studies started in 2020
    - National School Bus Retrofit Lottery Program – effects on student health and performance in school districts that won the lottery; **Sara Adar,** University of Michigan
    - Curbing transportation emissions in Texas – effects on birth outcomes; **Perry Hystad,** Oregon State University
    - National air quality policies and mortality trends during 2008-2018 (2 national Chinese cohorts); **Patrick Kinney,** Boston University
    - A coal ban and heat pump subsidy program in 50 villages around Beijing (panel study); **Sam Harper** and **Jill Baumgartner,** McGill University
- ***Also, a COVID accountability study and additional proposals from HEI's "open RFA" 20-1***

Complex Questions for the Air Pollution Mixture

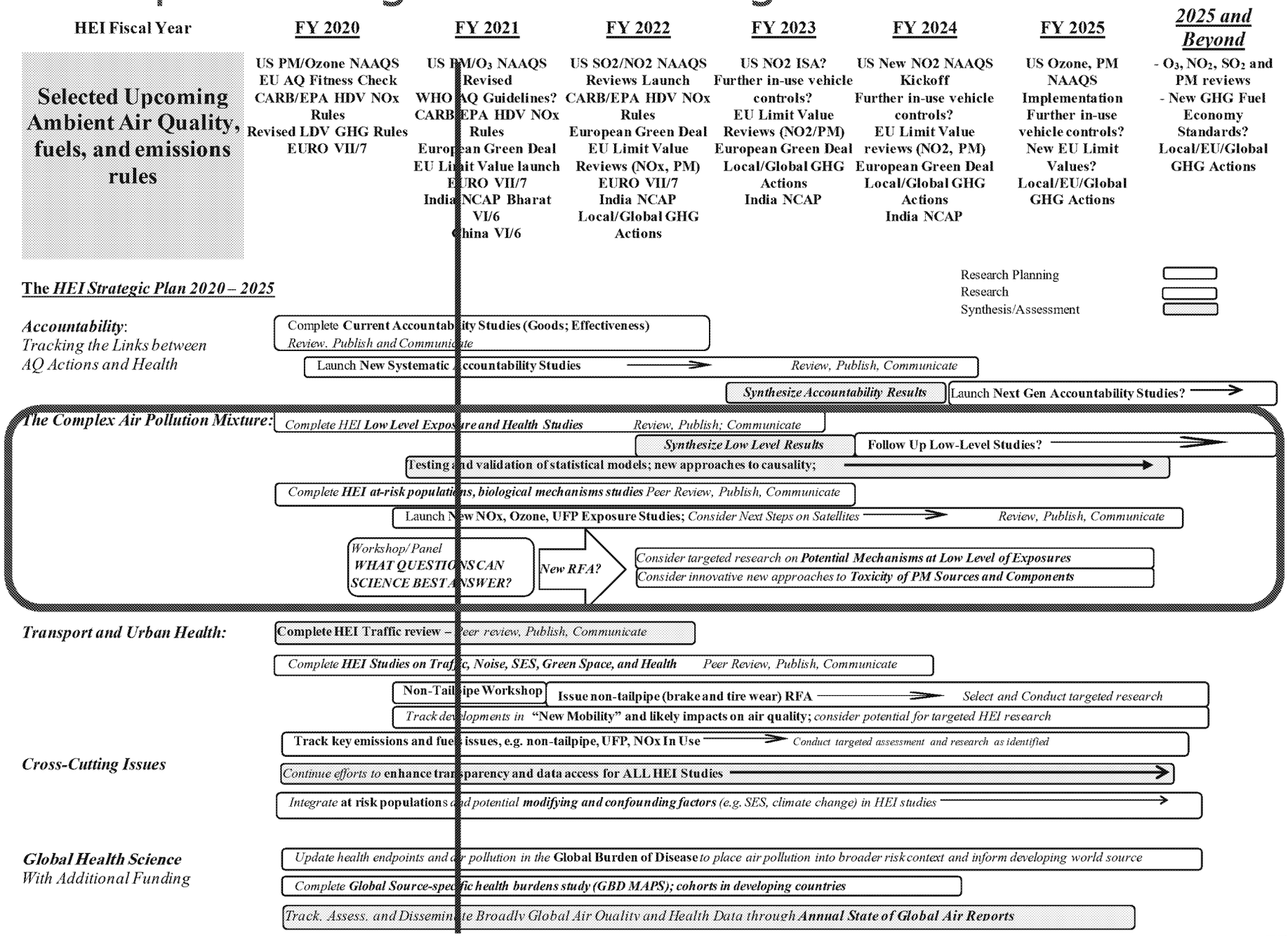


Challenges

Ambient levels of air pollution in high income countries declining, but challenges endure. For example:

- New reports of association between below-standards air pollution exposure and health effects; More research on-going
  - Are current standards sufficiently protective?
- Studies, including NPACT, report no clear-cut links between characteristic of PM and health effects;
  - Questions about differential toxicity persist, driven partly by control options
  - Role of particle composition, source, size, surface, other
- New, low-cost sensors promise to democratize exposure assessment
  - Many challenges yet to overcome
  - Major new development but how to communicate the risk

Implementing the HEI Strategic Plan 2020 – 2025



Probing the Health Effects of Exposure to Low Levels of Air Pollution

- Three HEI studies, with key features:
  - Populations with millions in the US, Canada, and Europe; administrative and traditional cohorts
  - Satellite data and ground level exposure measurements; high quality exposure assessment models at high spatial resolutions
  - Development and application of novel statistical methods
  - Investigator teams with prior experience of productive collaborations
- Initial results of North American studies published in November 2019 with HEI Commentaries
- Presented at Brussels workshop in January 2020
- Full Reports under review currently

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Ensuring the Highest Quality from the Low Exposure Studies

- *Detailed HEI oversight*
  -- Oversight Panel reviewed progress reports twice a year
  -- QA/QC audits
- *Intensive Peer Review*: Special Review Panel, with Sverre Vedal (chair, University of Washington) plus six additional experts in epidemiology, exposure assessment, and biostatistics
- *Communicating results:*
  - ISEE conference, HEI Annual Conference
  - Brunekreef EU Study – mid-2021 publication
  - Other reports to follow later in 2021/early 2022
  - Additional analyses underway, completion by late 2021

Enhanced Exposure Assessment for the Air Pollution Mixture (RFA 19-1) – studies started in 2020

3 studies on strategies for enhanced exposure assessment

- ✓ **Scott Weichenthal** of McGill University will develop and evaluate long-term exposure estimates from fixed-site and mobile measurement campaigns, as well as deep learning models, in Toronto and Montreal, Canada
- ✓ **Gerard Hoek** of Utrecht University will validate maps of modeled air pollution across the Netherlands using new measurements from over 100 sites, and evaluate the performance of several exposure models
- ✓ **Kees de Hoogh** of the Swiss Tropical and Public Health Institute plans to improve our understanding of the contribution of individual mobility in air pollution exposure estimates. He will use location tracking on a mobile phone application for 2,000 individuals in the Netherlands and Switzerland

2 studies on quantifying the influence of exposure error

- ✓ **Klea Katsouyanni** of King's College London will investigate the consequences of measurement error on estimates of health effects of long-term exposure to outdoor air pollution in London by developing increasingly sophisticated exposure models
- ✓ **Lianne Sheppard** of the University of Washington will compare scientific and logistical benefits of different approaches to air pollution exposure assessment. She will leverage large air pollution datasets obtained from low-cost sensors, mobile monitoring, and passive samplers

Complex Questions for the Air Pollution Mixture

- "Open RFA" 20-1A seeking smaller proposals in three important areas:
  - Accountability or effectiveness of air quality regulations
  - Strengthening causal interpretation of evidence from existing cohorts
  - Contributions of wildland and agricultural burning to air quality and health
  - > 60 additional preliminary applications received; 16 full applications requested
  - Decisions in Spring 2021; studies to begin in Summer/Fall 2021
- *Added, RFA 20-1B Spring 2020:* Targeted analyses of AQ and COVID-19

New Research on COVID-19 and air pollution (RFA 20-1B)

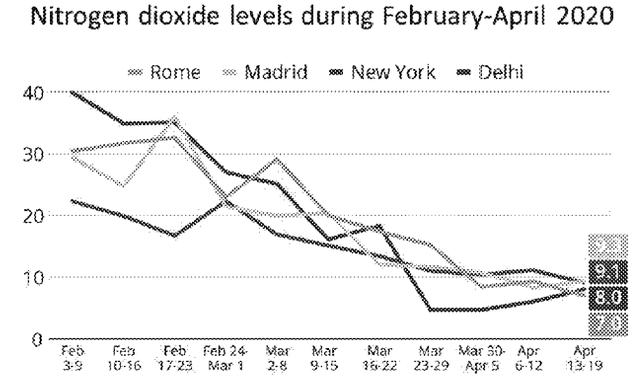
Susceptibility to COVID-19 health outcomes in areas with low air quality:

- **Zorana Andersen,** University of Copenhagen will study the risk of severe COVID-19 outcomes in susceptible groups in a Danish cohort.
- **Michael Kleeman,** UC–Davis will study chronic and acute effects of air pollution on COVID-19 outcomes using a large medical records database in Southern California
- **Jeanette Stingone,** Columbia University will look at neighborhood vulnerability to adverse COVID-19 outcomes in a racially diverse population in New York City.
- **Cathryn Tonne,** ISGlobal will study the risk of COVID-19 hospital admissions or mortality in vulnerable subgroups in Catalonia, Spain.

Effects of COVID lockdowns on air quality and health:

- **Kai Chen,** Yale University will study changes in mortality associated with NO_2 and $PM_{2.5}$ levels before and after the lockdown in China, Germany, Italy, and the United States

- 1- and 2-year studies expected to start shortly.



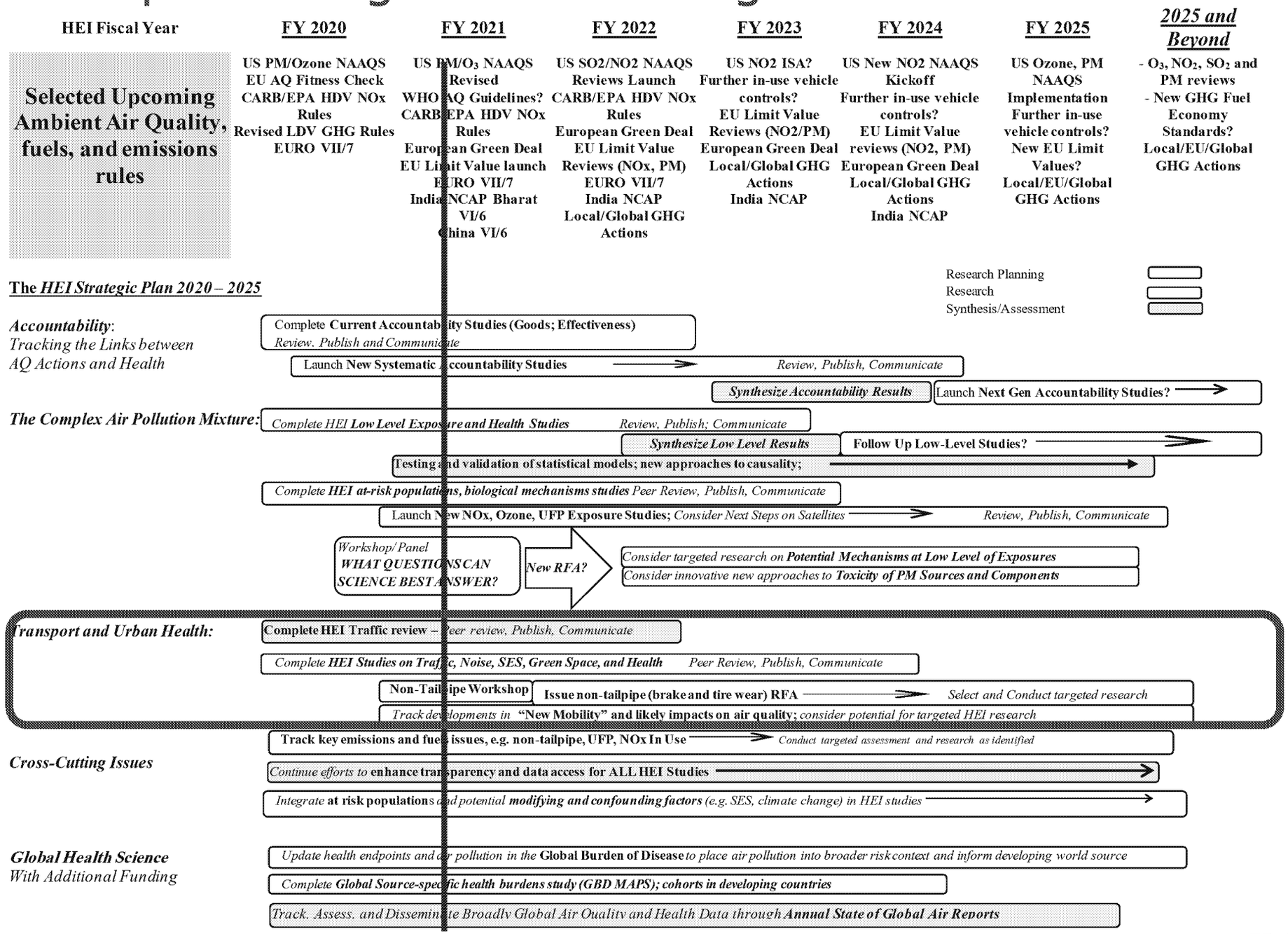
https://www.healtheffects.org/announcements/five-new-hei-studies-examine-intersection-air-pollution-exposure-covid-19

Transport and Urban Health

Challenges

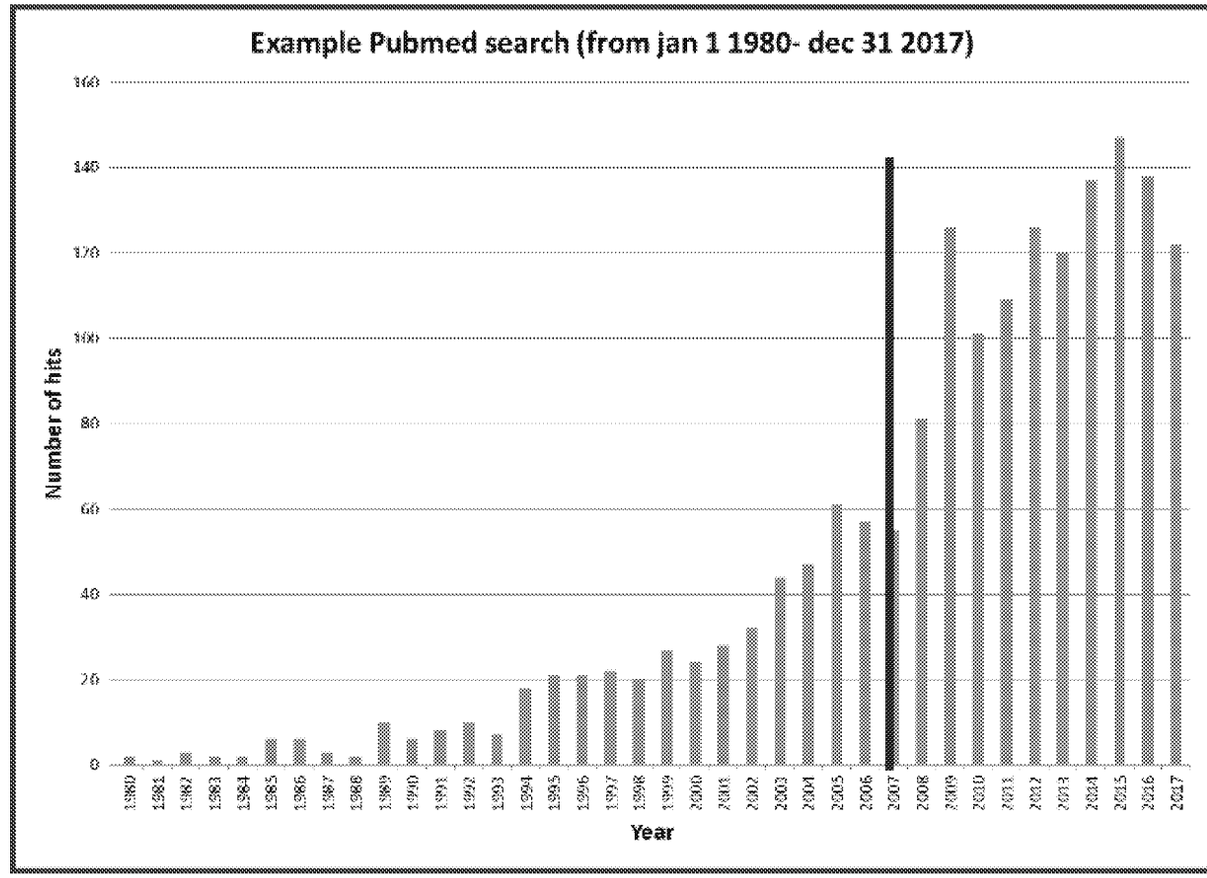
- A Host of new Technologies – EVs, AVs, TNCs – changing the future of Transport
  - Driven in part by GHG
- But continued trends for many years to come in US, Europe, Asia:
  - Long-lived internal combustion engines, especially GDI
  - Questions about NOx, UFP, in-use, non-tailpipe
  - Continued pressure to tighten standards
- And a growing focus on other factors: noise, socioeconomic status, access to green space, others

Implementing the HEI Strategic Plan 2020 – 2025



New Review of the Traffic Literature

- HEI published a comprehensive review in 2010, highly downloaded
- Strong interest in an update of the review from sponsors → 2015-2020 Strategic Plan
  - Substantial new research published
  - Also, trends in mobile source pollution, as regulations and technologies have advanced, and their potential implications
- A new panel *systematically reviewing* new epidemiologic studies: health endpoints, exposures, effects of noise, SES, green space.
- Analyses completed, internal review in progress; Peer Review starting shortly
- Revisions Summer/Fall 2021, published by early 2022
- ***Will Identify the Most Pressing Next Traffic Research Gaps to Fill***



HEI's Current, Broader Traffic Research

Traffic-Related Air Pollution, Noise, and Interactions With Socio-Economic Status

- Three four-year studies are past the half-way point:
  - Traffic-related air pollution and birth weight (FRONTIER study; **Dadvand and Sunyer**, ISGlobal)
  - Non-tailpipe emissions and noise from traffic and children's health (**Franklin**, University of Southern California)
  - Air pollution components, noise and socio-economic status (HERMES Study, **Raaschou-Nielsen**, Copenhagen University)

Other traffic exposure and non-tailpipe studies:

- Scalable multi-pollution exposure assessment using routine mobile monitoring platforms (**Josh Apte**, University of California, Berkeley) [Rosenblith Investigator] in its final year
- Non-tailpipe workshop held in November; Research Committee discussion whether/how to follow up with a Request for Applications

HEI-Global

Growing markets, high local and transported air pollution, public health impacts

Challenges

- Continued very high levels in countries around the world
  - Globally air pollution 4th leading risk factor for mortality
  - Over 90% live in areas above WHO Guidelines
- Major standard setting and source control getting underway
  - Limited science, not widely accepted
  - A lack of understanding on which sources pose greatest risk, need control
  - A need to understand all sources, including transport in a broad context: coal, industry, household burning, others
- New Global Health Leader: HEI Senior Scientist Pallavi Pant

HEI Global Platform

Additional Funding: Bloomberg Philanthropies, Clean Air Fund, Children's Investment Fund Foundation

Annual Global Burden of Disease Report (GBD) the gold standard for understanding relative health outcomes and risk factors worldwide

HEI supports the global air pollution analysis, conducts extended in-depth national analysis

The State of Global Air

- Annual report presenting global & country-specific air pollution exposures, health impacts, trends

Global Burden of Disease from Major Air Pollution Sources (GBD MAPS-Global)

Identify source specific health impacts ***worldwide (Fall)***

Targeted Analysis, Reports, Active Communication

- "Spotlight Reports" of Source Impacts, "Special Reports" Shipping, Household, more

Informing WHO Air Quality Guidelines, Euro limit values, national standards, IARC, industry

Capacity Building

Support for targeted research, investigator capacity building in selected geographies (e.g. India)

HEI

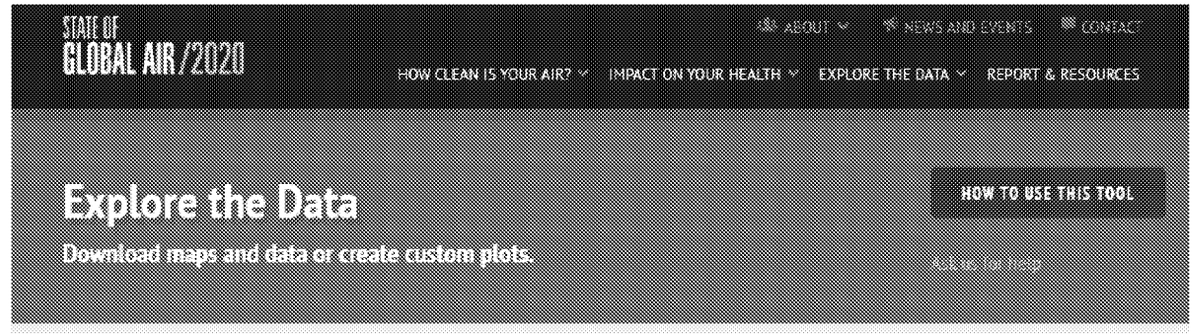
State of Global Air

(www.stateofglobalair.org)

- *Tracks and communicates pollution, impacts, trends.*

  Extensive interactive web site allowing government officials, scientists and stakeholders to find out:

  - The level and effects of air quality by country
  - Comparison to neighboring countries
  - Trends since 1990
  - Comparison of health burden from GBD, WHO, IEA, World Bank, others
  - New health endpoints affected by air pollution (e.g., life expectancy, diabetes, birth outcomes)
  - ***Upcoming:*** *Long term NO2 exposures and effects*



GBD – MAPS Global

(2021)

GBD-MAPS Global will identify which sources/sectors contribute most to air pollution and health in 195 countries

- **Health-based air quality management** by source

  -often in areas with limited data

- **Fuel specific impacts** (coal and biofuels)

  -transport in context

- **Communicated** to policy makers, public via SoGA, GBD and direct HEI engagement

Investigators: *R. Martin, M. Brauer et al.*

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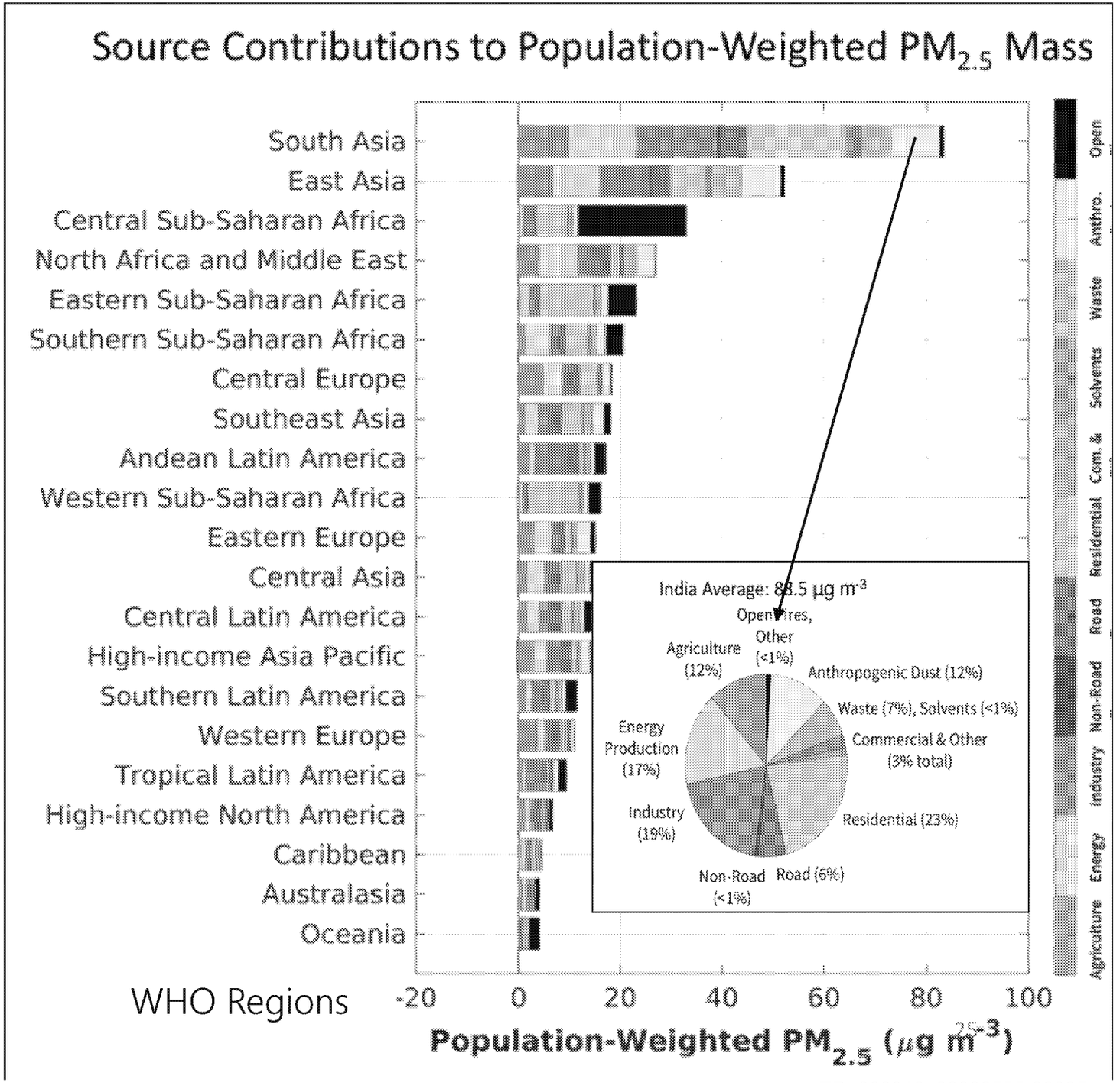
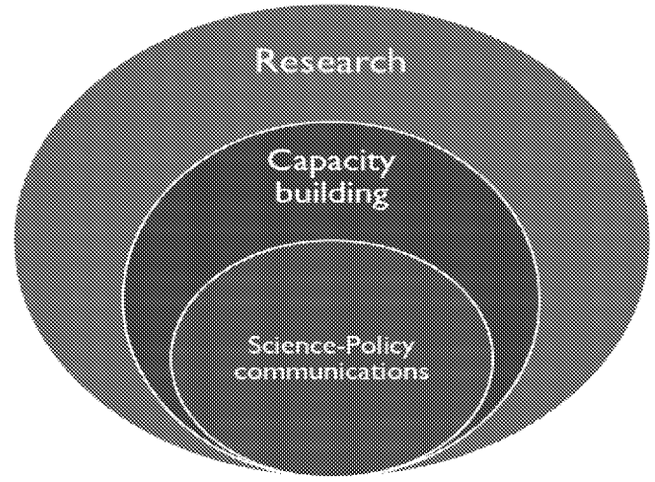


HEI Global Platform: *Regional Deployment*

High air pollution, significant health impacts,
limited science / local capacity



South Eastern Europe

Initial analysis and online database of existing studies

HEI *Spotlight Reports*

- *Characterize air pollution and health*
- Review of local, regional and global publications
- GBD MAPS analysis nationally
- Basic benefits analysis re WHO AQG

Active communication by \ with local partners

India

New local collaborative on air pollution and health effects Research (CAPHER)

- Indian government, science partners

Evaluate current Indian evidence in global context

Strategic plan for targeted research

Training \ capacity building studies by local researchers

Policy relevant communication

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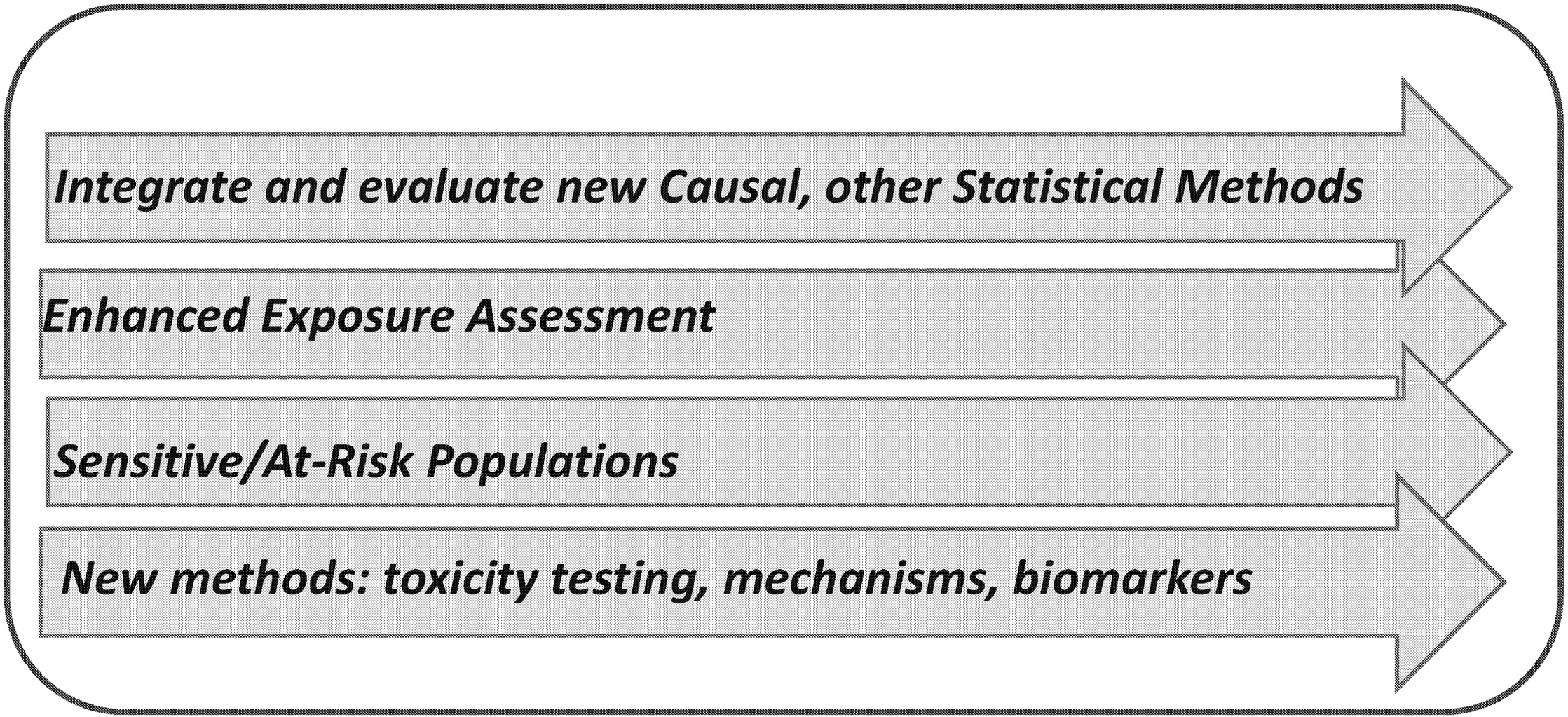
Cross-Cutting Issues to be Integrated Into All HEI Science



A major Cross-Cutting Issue: *Transparency in Policy-Relevant Science*

Challenges:

- Continued need to enhance data sharing for full transparency
  - "Big Data" both an opportunity and a challenge
- Systematic reviews must be truly systematic, and tested for bias
- Causal determinations need to be made in most rigorous way possible
  - Drawing on all lines of evidence

Opportunities

- HEI supporting new "data hubs" for making all underlying data accessible
- New systematic reviews underway at HEI – as models
- Opportunity for research with new causal inference methods in upcoming HEI Low-Level and Accountability Studies

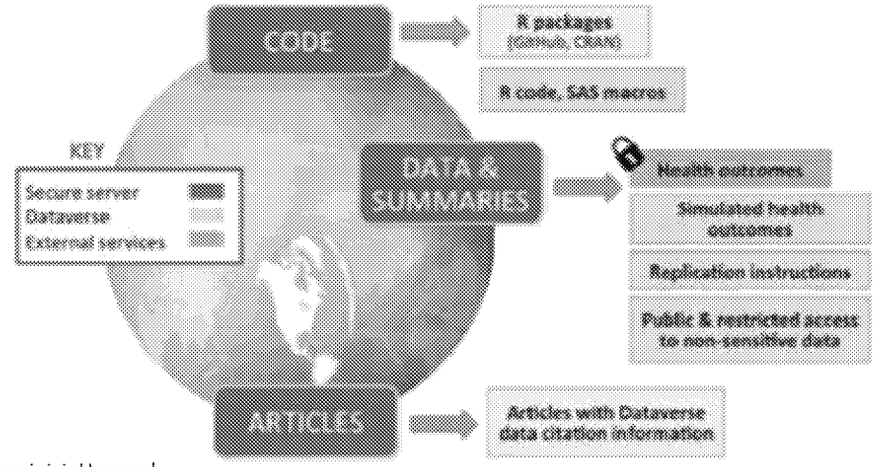
Data Access: A continuing interest

Key to scientific credibility and transparency

Longstanding HEI policy on data sharing

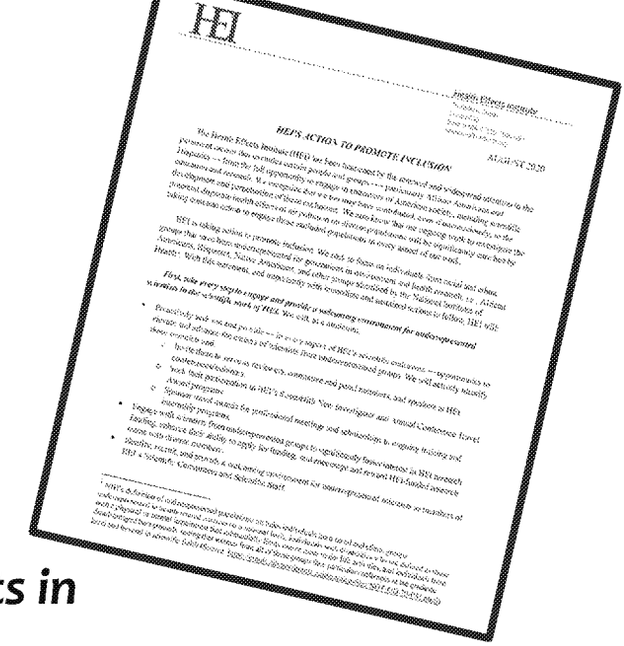
Recent Examples:

- RIOPA study – indoor, outdoor and personal exposures in three US cities → 40+ papers
- Data from MOSES – available since 2018
- Dominici and other low exposure studies – Exposure data available; Medicare data accessible (three groups accessed already)
- Wang (tunnel study) – data will be made public



From: Francesca Dominici, Harvard Chan School of Public Health

ONE IMPORTANT ADDITION:
HEI'S ACTION TO PROMOTE INCLUSION August 2020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HEI'S ACTION TO PROMOTE INCLUSION

AUGUST 2020

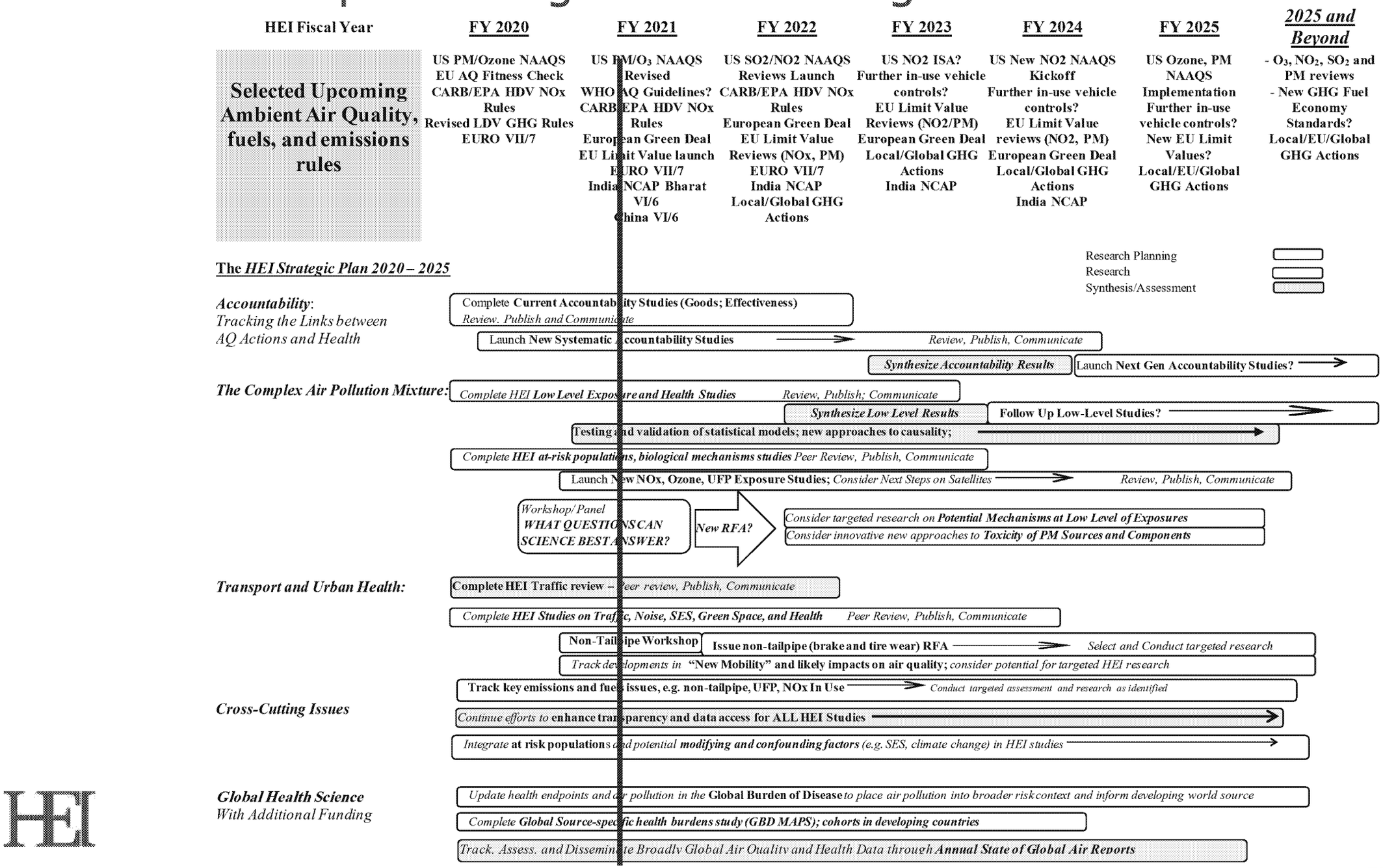
HEI is taking action to promote inclusion of individuals from racial and ethnic groups that have been systematically underrepresented for generations in environment and health research.

Engage with and provide a welcoming environment for underrepresented scientists in every aspect of HEI's Scientific Endeavors

Provide a safe and welcoming environment for all at HEI, free from discrimination of all types

Take both immediate <u>and</u> sustained action. Analyze our track record, set goals for improving our performance, monitor progress, report publicly and regularly on progress — and steps still to be taken.

Implementing the HEI Strategic Plan 2020 – 2025



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- **ExxonMobil**
- **API**
- **Other?**

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Dear Colleagues:

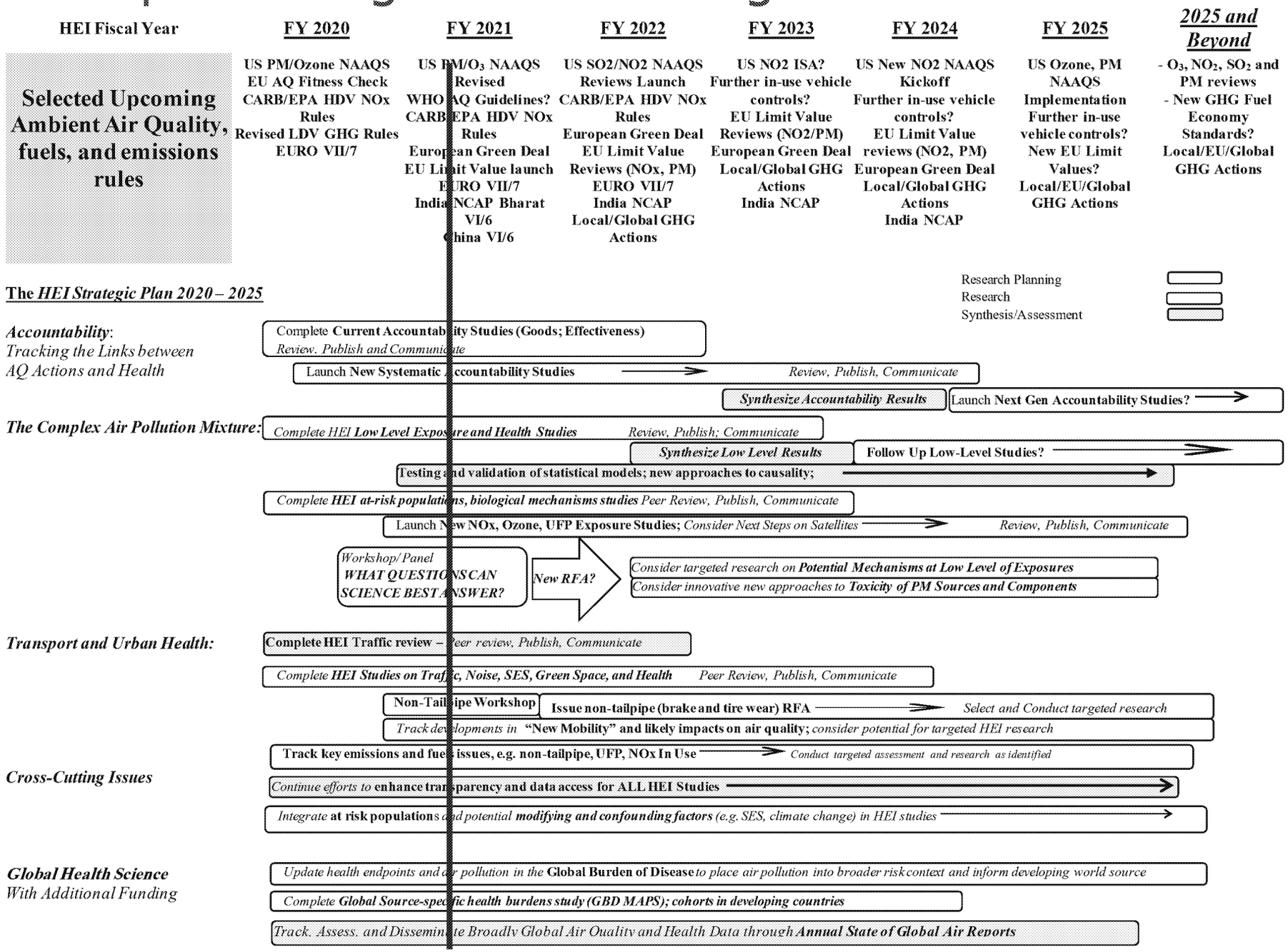
I am pleased to invite you to **HEI's 2021 Annual Conference,** to be held virtually via a series of seven weekly webinars every Tuesday 10AM-NOON EST from April 6th through May 25th, 2021.

Below you will find the scheduled program. We hope you will save the dates for what promises to be an excellent scientific program, presenting a wide range of novel and timely air pollution research topics.

April 6 - Climate Change, Air Quality, and Health
April 13 - Environmental Health Research with Communities
April 20 - From Global to Local: Informing Air Quality Policies and Decision-Making
April 27 - The COVID-19 Pandemic, Air Pollution, and Health: Lessons from Around the Globe
May 4 - From Evidence to Action: Synthesizing Air Quality Evidence Relevant to Public Health
May 11 - Non-tailpipe Emissions: Impacts on Urban Air Quality and Health
May 25 - What Have We Learned about Effects on Health at Low Levels of Exposure: Evidence from the United States, Canada, and Europe

We will be in touch with more information on the conference program in February. Please save the date and we look forward to seeing you!

Implementing the HEI Strategic Plan 2020 – 2025



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THANK YOU!

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Annemoon van Erp
avanerp@healtheffects.org

Trusted Science • Cleaner Air • Better Health

Other New Research: 5 Rosenblith Awards supporting early careers at Assistant Professor level

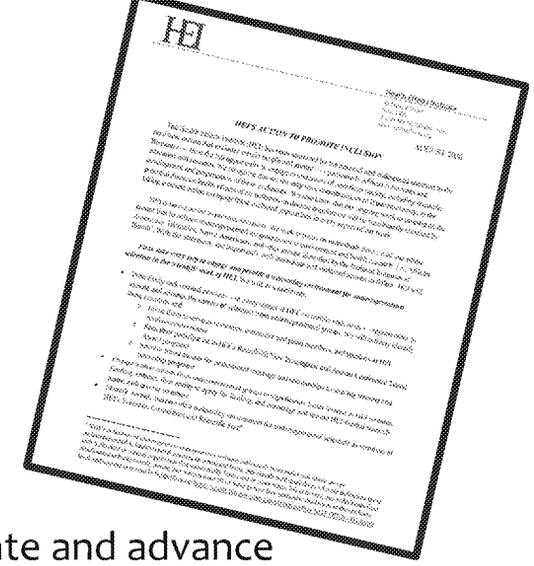
RFA 19-2 – studies started in 2020:

- **Tanya Alderete,** University of Colorado is studying whether prenatal and early-life exposure to air pollutants affects the infant gut microbiota, thereby altering infant growth trajectories
- **Megan Herting,** University of Southern California will study how $PM_{2.5}$ exposure affects the development of prefrontal connections and emotional behaviors during the transition from childhood to adolescence

RFA 20-2 – studies starting soon:

- **Heresh Amini,** University of Copenhagen will study long-term exposure to ultrafine particles on mortality and morbidity in a new Danish cohort.
- **Joseph Antonelli,** University of Florida plans to develop statistical methodology to estimate causal effects of multivariate exposures.
- **Raphael Arku,** University of Massachusetts Amherst will study the effects of maternal exposure to $PM_{2.5}$, NO_2, and environmental noise on adverse birth outcomes in Accra, Ghana.

ONE IMPORTANT ADDITION:
HEI'S ACTION TO PROMOTE INCLUSION August 2020



HEI is taking action to promote inclusion of individuals from racial and ethnic groups that have been systematically underrepresented for generations in environment and health research.

Engage with and provide a welcoming environment for underrepresented scientists

- Proactively seek out and provide — *in every aspect of HEI's scientific endeavors* — opportunities to elevate and advance careers of scientists from underrepresented groups.
- Engage with scientists from underrepresented groups to significantly foster interest in HEI research funding, enhance their ability to apply for funding, and encourage and reward HEI-funded research teams with diverse members.
- Identify, recruit, and provide a welcoming environment for underrepresented scientists as members of HEI's Scientific Committees and Scientific Staff.

Provide a safe and welcoming environment for all at HEI, free from discrimination of all types

- Scrutinize and revise as necessary all personnel and other policies.
- Significantly enhance efforts to actively recruit more diverse members to the HEI staff, leadership, and the Board of Directors.
- Take every opportunity to enhance the diversity of our procurement sources.

Take both immediate <u>and</u> sustained action. Analyze our track record, set goals for improving our performance, monitor progress, report publicly and regularly on progress — and steps still to be taken.